REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 36 and 37 have been added, and claims 6, 8, 11, 19, 22, 23, 24, 26, and 35 have been amended in accordance with 37 CFR §1.173 relative to the issued patent, U.S. Patent No. 5,808,805. Support for the changes in claims 23, 26, and 35 is found in, among other embodiments of the invention, the embodiment shown in FIG. 2 and in col. 7, line 54 to col. 8, line 16 in which the first and second converging groups G1, G2 form an intermediate image, and a third converging group G3 forms a second intermediate image on the wafer.

New claims 36 and 37 correspond to claims 32 and 34, as filed, and are deemed supported for reasons similar as to why claims 32 and 34 are supported. Claims 36 and 37 are further deemed patentable over the prior art for reasons claims 32 and 34, as filed, are deemed patentable over the prior art.

Moreover, claims 6, 8, 11, 19, 22, and 24 have been amended to correct typographical errors as indicated.

No new matter is being presented, and approval and entry of the foregoing new claims and amendments are respectfully requested.

Claims 1-37 are pending and under consideration. Reconsideration is requested.

OBJECTION TO THE CLAIMS:

On page 2 of the Office Action, the Examiner objects to claim 6 for having an apparent typographical error. In reviewing the reissue application as filed, it appears that the typographical error was accidentally introduced into claim 6 at the filing of the instant reissue application. However, the typographical error was not present in claim 6 when claim 6 issued in U.S. Patent No. 5,808,805. In view of the above amendment to claim 6 to place claim 6 in the same condition in which claim 6 issued in U.S. Patent No. 5,808,805, it is respectfully requested that the Examiner reconsider and withdraw the objection.

REJECTION UNDER 35 U.S.C. §102:

In the Office Action at pages 2-4, the Examiner rejects claims 23, 26, 27, 30, 31, 33, and 35 under 35 U.S.C. §102(e) in view of Suenaga et al. (U.S. Patent No. 5,668,673). This rejection is respectfully traversed and reconsideration is requested.

By way of review, claim 23 recites, among other features, first and second image-forming optical systems. The second image-forming optical system "comprises a dioptric imaging

system which includes a refractive lens component and an aperture stop." Claim 23 further recites that "an intermediate image of said pattern of said first surface is formed at a predetermined position of said optical path of light that travels from said second group to said second image-forming optical system." Claim 23 additionally recites that "the dioptric imaging system of said second image-forming optical system extends from the intermediate image of said pattern to a second image formed by said second image-forming optical system at said second surface."

In contrast, Suenaga et al. discloses first and second lens groups G1, G2, which form a primary reduced image I1. Suenaga et al. further discloses third and fourth lens groups G3, G4 that receive light reflected from a second concave reflection mirror M2 so as to form a second reduced image I2. (Col. 2, line 64 to col. 3, line 8; FIG. 1). However, since Suenaga et al. suggests using the second concave reflection mirror M2 as shown in FIG. 1 to form the second reduced image I2, Suenaga et al. teaches using reflected light from a concave mirror in the optical system disposed between the primary reduced image I1 and the second reduced image I2. As such, it is respectfully submitted that Suenaga et al. does not disclose or suggest the invention recited in claim 23.

For at least similar reasons, it is respectfully submitted that Suenaga et al. does not disclose the invention recited in claims 26 and 35.

Claims 27, 30, 31, and 33 are deemed patentable due at least to their depending from claims 26.

JUDICIALLY CREATED DOCTRINE OF OBVIOUSNESS TYPE DOUBLE PATENTING:

In the Office Action at pages 4-5, the Examiner rejects claims 10, 11, 21-24, 26, 27, 30-33, and 35 under the judicially created doctrine of obviousness type double patenting in view of claims 1-31 of U.S. Patent No. 5,999,333. The rejection is respectfully traversed and reconsideration is requested.

In view of the enclosed executed Terminal Disclaimer, it is respectfully requested that the Examiner reconsider and withdraw the rejection.

STATUS OF CLAIMS NOT REJECTED:

On page 1 of the Office Action, the Examiner allows claims 1-9, 12-20, and 25, and objects to claims 28, 29, and 34 for depending from rejected claims.

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ATTACHMENT SHOWING AMENDMENTS:

While not required under 37 CFR §1.173, please find enclosed a Version With Markings To Show Changes Made, which is provided for the convenience of the Examiner. The changes are relative to the reissue application, as filed.

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot. And further, it is respectfully submitted that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.

If there are any additional fees associated with the filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please **ADD** claims 36 and 37, and **AMEND** claims 6, 8, 11, 19, 22, 23, 24, 26, and 35, as follows:

6. (ONCE AMENDED) A catadioptric projection optical system for projecting an image of a pattern of a first surface onto a second surface, comprising:

a first image-forming optical system for forming an intermediate image of the pattern of said first surface, and

a second image-forming optical system for forming an image of said intermediate image on said second surface,

wherein said first image-forming optical system includes:

a first group with a positive refractive power, comprising a refractive lens component, for converging a light beam from the pattern of said first surface;

a beam [sputter] splitter for separating a part of a light beam from said first group by a beam-splitter surface arranged obliquely to an optical axis of said first group, said beam splitter disposed on the optical axis of said first group; and

a second group with a positive refractive power, comprising a concave, reflective mirror for reflecting the light beam separated by said beam splitter, for forming said intermediate image of the pattern between the concave, reflective mirror and the second image-forming optical system, said beam splitter provided between said concave, reflective mirror and said second image forming optical system.

8. (ONCE AMENDED) A catadioptric projection optical system according to claim 6, wherein

the following conditions are satisfied:

$$p_1+p_3>0,\ p_2<0,\ \text{and}\ |p_1+p_2+p_3|<0.1,$$

where p_1, p_2, and p_3 are individual Petzval's sums of said first group, second group, and second image-forming optical system; and

wherein the following conditions are satisfied:

$0.1<|\beta_{12}|<0.5$ and $0.25<|\beta_3|<2$,

where β_{12} is a magnification [of] from the pattern on said first surface to said intermediate image and β_3 is a magnification [of] from said intermediate image to said image on the second surface.

11. (ONCE AMENDED) A catadioptric projection optical system according to claim 10, wherein
the following conditions are satisfied:

$p_1+p_3>0$, $p_2<0$, and $|p_1+p_2+p_3|<0.1$,

where p_1, p_2, and p_3 are individual Petzval's sums of said first group, second group, and second image-forming optical system; and
wherein the following conditions are satisfied:

$0.1<|\beta_{12}|<0.5$ and $0.25<|\beta_3|<2$,

where β_{12} is a magnification [of] from the pattern on said first surface to said intermediate image and β_3 is a magnification [of] from said intermediate image to said image on the second surface.

19. (ONCE AMENDED) An exposure apparatus according to claim 17, wherein the following conditions are satisfied:

$p_1+p_3>0$, $p_2<0$, and $|p_1+p_2+p_3|<0.1$,

where p_1, p_2, and p_3 are individual Petzval's sums of said first group, second group, and second image-forming optical system; and
wherein the following conditions are satisfied:

$0.1<|\beta_{12}|<0.5$ and $0.25<|\beta_3|<2$,

where β_{12} is a magnification [of] from the pattern on said first surface to said intermediate

image and β_3 is a magnification [of] from said intermediate image to said image on the second surface.

22. (ONCE AMENDED) An exposure apparatus according to claim 21, wherein the following conditions are satisfied:

$$p_1+p_3>0,\ p_2<0,\ \text{and}\ |p_1+p_2+p_3|<0.1,$$

where p_1, p_2, and p_3 are individual Petzval's sums of said first group, second group, and second image-forming optical system; and

wherein the following conditions are satisfied:

$$0.1<|\beta_{12}|<0.5\ \text{and}\ 0.25<|\beta_3|<2,$$

where β_{12} is a magnification [of] from the pattern on said first surface to said intermediate image and β_3 is a magnification [of] from said intermediate image to said image on the second surface.

23. (TWICE AMENDED) A catadioptric projection optical system for projecting an image of a pattern of a first surface onto a second surface, said catadioptric projection optical system comprising:

a first image-forming optical system[,];

a second image-forming optical system[,];

and a partial mirror,

wherein

said first image-forming optical system includes[:]

a first group with a positive refractive power, said first group comprising a refractive lens component; and

a second group with a positive refractive power, said second group comprising a concave, reflective mirror,

said second image-forming optical system comprises a dioptric imaging system which includes a refractive lens component and an aperture stop,

light from said first surface passes through in order said first group, said second group, said partial mirror, and said second image-forming optical system and thereafter said light reaches said second surface,

said partial mirror is positioned so as to avoid disposing on an optical path of light that travels from said first group to said second group and is disposed on an optical path of light that travels from said second group to said second image-forming optical system, [and]

an intermediate image of said pattern of said first surface is formed at a predetermined position of said optical path of light that travels from said second group to said second image-forming optical system, and

the dioptric imaging system of said second image-forming optical system extends from the intermediate image of said pattern to a second image formed by said second image-forming optical system at said second surface.

24. (ONCE AMENDED) A catadioptric projection optical system according to claim 23, wherein

the following conditions are satisfied:

$$p_1+p_3>0,\ p_2<0,\ \text{and}\ |p_1+p_2+p_3|<0.1,$$

where p_1, p_2, and p_3 are individual Petzval's sums of said first group, second group, and second image-forming optical system; and

wherein the following conditions are satisfied:

$$0.1<|\beta_{12}|<0.5\ \text{and}\ 0.25<|\beta_3|<2,$$

where β_{12} is a magnification [of] from the pattern on said first surface to said intermediate image and β_3 is a magnification [of] from said intermediate image to said image on the second surface.

26. (ONCE AMENDED) A catadioptric imaging optical system used in a projection exposure apparatus that transfers a pattern on a mask onto a substrate, comprising:

a first imaging optical sub-system arranged in an optical path between the mask and the substrate, said first imaging optical sub-system comprising

a first group with a lens, and

a second group with a concave mirror,

wherein said first imaging optical sub-system forms an intermediate image of the pattern;

a second imaging optical sub-system arranged in an optical path between said first imaging

optical sub-system and the substrate, wherein said second imaging optical sub-system forms an image of the intermediate image on the substrate and comprises a dioptric imaging system which extends from the intermediate image to the image of the intermediate image; and

an optical path deflecting member arranged between said first group and said second group of said first imaging optical sub-system, wherein said optical path deflecting member changes a direction of either a light beam from said first group or a light beam reflected by the concave mirror.

35. (ONCE AMENDED) A method of imaging a pattern on a mask onto a substrate, comprising:

guiding a light from the mask to a first group, wherein the first group comprises a lens;

guiding the light from the first group to a second group, wherein the second group comprises a concave mirror;

forming an intermediate image of the pattern based on the light from the second group;

guiding the light from the intermediate image to a dioptric imaging sub-system;

forming an image of the intermediate image on the substrate based on the light from the dioptric imaging sub-system, the dioptric imaging sub-system extending from the intermediate image to the formed image of the intermediate image; and

changing a direction of either the light beam from the first group or the light beam reflected by the concave mirror, in a space between the first group and the second group.

36. (NEW) A catadioptric imaging optical system used in a projection exposure apparatus that transfers a pattern on a mask onto a substrate, comprising:

a first imaging optical sub-system arranged in an optical path between the mask and the substrate, said first imaging optical sub-system comprising

a first group with a lens, and

a second group with a concave mirror,

wherein said first imaging optical sub-system forms an intermediate image of the pattern;

a second imaging optical sub-system arranged in an optical path between said first imaging optical sub-system and the substrate, wherein said second imaging optical sub-system forms an image of the intermediate image on the substrate; and

an optical path deflecting member arranged between said first group and said second group of said first imaging optical sub-system, wherein said optical path deflecting member changes a direction of either a light beam from said first group or a light beam reflected by the concave

mirror,

wherein the following conditions are satisfied:

$\beta_1+\beta_2>0$,

$|\beta_1+\beta_2+\beta_3|<0.2$,

$0.1<|\beta_{12}|<0.5$, and

$0.25<|\beta_3|<2$,

where

β_1, β_2 and β_3 are individual Petzval's sums of said first group, said second group, and said second imaging optical system,

β_{12} is a magnification of an optical system positioned in an optical path from the mask to the intermediate image, and

β_3 is a magnification of an optical system positioned in an optical path from the intermediate image to the substrate.

37. (NEW) A catadioptric imaging optical system used in a projection exposure apparatus that transfers a pattern on a mask onto a substrate, comprising:

a first imaging optical sub-system arranged in an optical path between the mask and the substrate, said first imaging optical sub-system comprising

a first group with a lens, and

a second group with a concave mirror,

wherein said first imaging optical sub-system forms an intermediate image of the pattern;

a second imaging optical sub-system arranged in an optical path between said first imaging optical sub-system and the substrate, wherein said second imaging optical sub-system forms an image of the intermediate image on the substrate; and

an optical path deflecting member arranged between said first group and said second group of said first imaging optical sub-system, wherein said optical path deflecting member changes a direction of either a light beam from said first group or a light beam reflected by the concave mirror,

wherein

said second imaging sub-system comprises an optical axis along a straight line,

said first group has a positive refractive power and said second group has a positive power, and

the reticle and the substrate are scanned at different speeds corresponding to the magnification of said catadioptric imaging optical system.